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AUTOMATIC SOLAR TRACKING STREET LIGHT SYSTEM

J Component Project | Final Review

INTRODUCTION TO
INNOVATIVE PROJECTS
(PHY1999)

Submitted To

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Problem Statement

When you get up at morning you may have noticed that street lights are still ON when it's not necessary & when you travel to rural areas either there is no street lamp or there are not so many vehicles to fully utilize that facility. Simply it means the wastage of electricity.

At the beginning, street lamps were controlled manually in which the control switch was set in each of the street lamps. That was called as the first generation of the original street light. Another method that has been used after that was based on the optical control method. In this method the high pressure sodium lamps were used.



Objective

The main purpose of this project is to minimize the cost & loss of electricity and also man power to manually on- off the street light.

Our objective is to provide a fully automated street light control which will definitely affect mankind. It will provide a public lighting system which is cost effective; it will help in reduction of crime, & it has less effect on environment.



Introduction



As the non-renewable energy resources are decreasing, the use of renewable resources for producing electricity is increasing. Solar panels are becoming more popular day by day. Solar panel absorbs the energy from the Sun, converts it into electrical energy and stores the energy in a battery.

This energy can be utilized when required or can be used as a direct alternative to the grid supply. The utilization of the energy stored in batteries is mentioned in the below-given applications. The position of the Sun with respect to the solar panel is not fixed due to the rotation of the Earth. For efficient usage of solar energy, the Solar panels should absorb energy to a maximum extent.

This can be done only if the panels are continuously placed in the direction of the Sun. So, the solar panels should continuously rotate in the direction of the Sun. This PROJECT describes about circuit that rotates solar panels.

Our Solution



Automatic solar tracking Street Light Control System is a simple yet powerful concept, which uses a transistor as a switch. By using this system manual works are 100% removed.

The necessity of boot loading of a microcontroller with Arduino is understood. It automatically switches ON lights when the sunlight goes below the visible region of our eyes. This is done by a sensor called Light Dependent Resistor (LDR) which senses the light actually like our eyes.

It automatically switches OFF lights whenever the sunlight comes, visible to our eyes.

By using this system energy consumption is also reduced because nowadays the manually operated street lights are not switched off even the sunlight comes and also switched on earlier before sunset. In this project, there is no need for a manual operation like ON time and OFF time settings.

MODEL OF

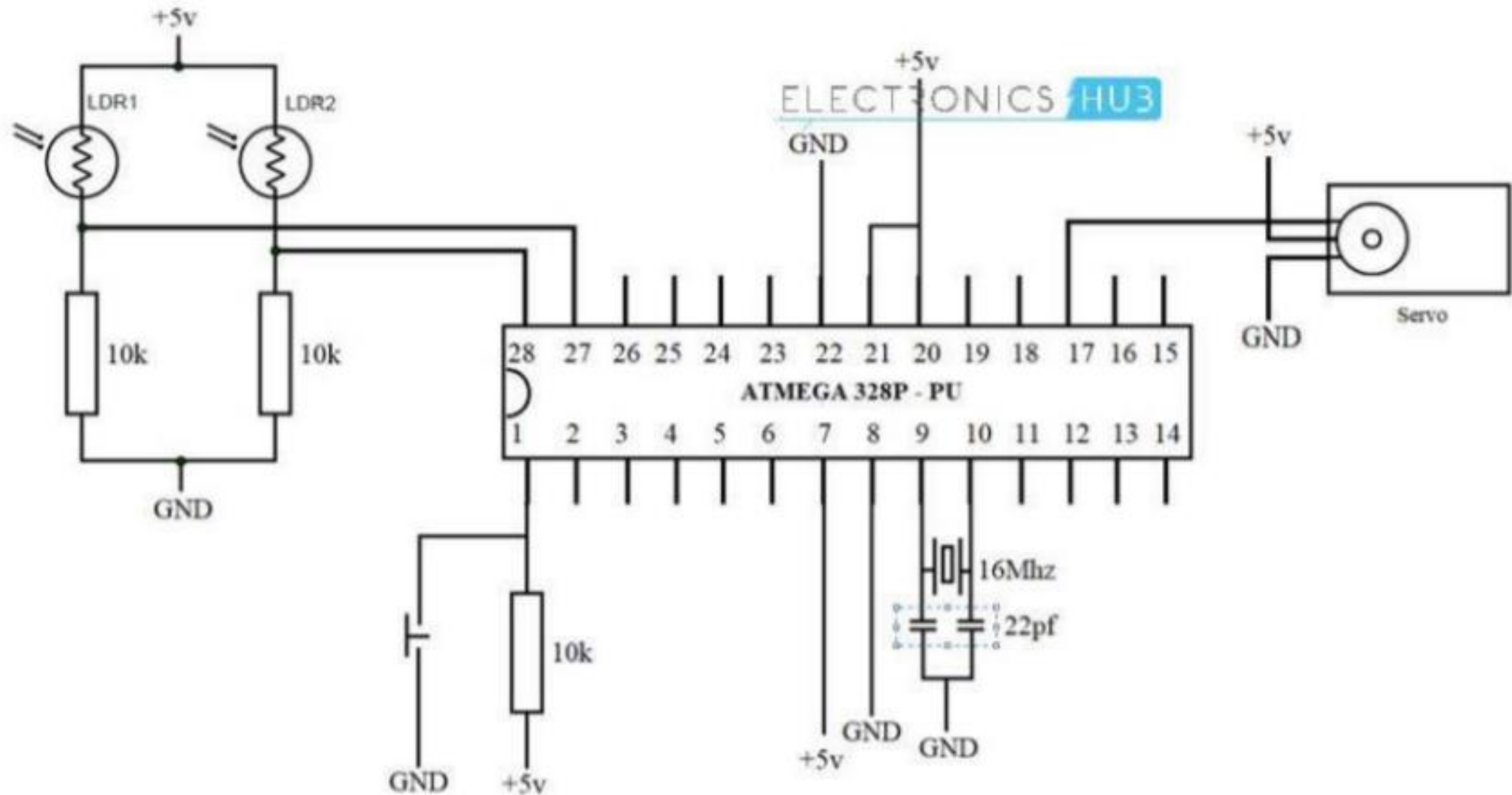
APPLICATION

Two light-dependent resistors are arranged on the edges of the solar panel. Light-dependent resistors produce low resistance when light falls on them.

The panel is rotated in the direction of the Sun by the servo motor linked to it. The panel is set up in such a manner that the light on two LDRs is compared, and the panel is turned towards the LDR with the highest intensity, i.e. lowest resistance, in comparison to the others.

The panel is rotated at an angle using a servo motor.

CIRCUIT DIAGRAM



KEY COMPONENTS

1.SOLAR PANEL

The solar panel consists of photovoltaic cells arranged in order. The photovoltaic cell is nothing but a solar cell. The solar cell is made up of semiconductor material silicon.

When a light ray from Sun is incident on the solar cell, some amount of energy is absorbed by this material. The absorbed energy is enough for the electrons to jump from one orbit to other inside the atom. Cells have one or more electric field that directs the electrons which creates current.

By placing metal contact energy can be obtained from these cells.

KEY COMPONENTS

2.ATmega 328 MICROCONTROLLER

ATmega328 is an AVR(automatic voltage regulator) family micro controller. It is based on advanced RISC architecture. It is an 8-bit controller.

It has 32K Bytes of Programmable Flash memory, 1K Bytes of EEPROM and 2K Bytes of SRAM. It has 23 programmable I/O pins.

It supports peripheral features like two 8-bit timers, one 16-bit timer, 6 channel ADC with 10-bit resolution, programmable USART, Serial Peripheral Interface, 2 wire serial interface (I2C), etc.

KEY COMPONENTS

3.LDR-LIGHT DEPENDENT RESISTORS

Light Dependent Resistors or LDRs are the resistors whose resistance values depend on intensity of the light.

As the intensity of light falling on the LDR increases, resistance value decreases. In dark, LDR will have maximum resistance.

LDR will output an analog value which should be converted to digital. This can be done using analog to digital converter.

KEY COMPONENTS

4. SERVO MOTORS

Servo motor is used to rotate the panel.

To drive the servo motor, a PWM Signal must be provided to its control pin which is managed by the microcontroller, connected to the control pin of the servo motor.

By connecting a battery to the solar panel, you can store the energy generated by the solar cells and this energy can be used when required. There are separate charge controller circuits dedicated to efficiently controlling the charge acquired from solar panels and charge the batteries.



HOW SOLAR TRACKING PANEL WORKS?

- Assemble the circuit as described and upload the code to ATmega328 Microcontroller.
- Power on the circuit and place the set up directly under the Sun (on the rooftop).
- Based on the light falling on the two LDRs, the ATmega328 Microcontroller changes the position of the Servo Motor which in turn moves in the panel.

APPLICATIONS OF SUN TRACKING SOLAR PANEL



Traffic

These panels can be used to power the traffic lights and streetlights.

Home

These can be used in home to power the appliances using solar power.

Industry

These can be used in industries as more energy can be saved by rotating the panel.

Advantages

- The solar energy can be reused as it is non-renewable resource.
- This also saves money as there is no need to pay for energy used (excluding the initial setup cost).
- Helps in maximizing the solar energy absorption by continuously tracking the sun.

Disadvantages

- Though solar energy can be utilized to maximum extent this may create problems in rainy season.
- Although solar energy can be saved to batteries, they are heavy and occupy more space and required to change time to time.
- They are expensive.

Conclusion



So we have looked into various sciences involving to make a project. We made automatic solar rotating panel which rotates on a regular interval around the sun. Learning about the microcontroller and the coding of Atmega 328 microcontroller and the usage of LDRs are understood.

This auto rotating solar panel is used in a large scale industries where a robot has an actuator and it processes the solar panels by rotating them. To get the maximum sunlight in a limited distance, two solar panels were placed in bi-facial manner and reflectors. LDRs are used to detect the sun direction.

And the energy from the solar panels is stored in battery. The stored energy is used for street lights. These street lights are automated. This automation process is done by the microcontroller with help of LDR. The street lights switched ON in night and switched OFF in day times.

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Thank You!

